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| 09/755,667      | 01/04/2001  | Stuart F. Oberman    | 5989-01500          | 5287             |

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EXAMINER

NG, CHRISTINE Y

| ART UNIT | PAPER NUMBER |
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2663

DATE MAILED: 04/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/755,667

Applicant(s)

OBERMAN ET AL.

Examiner

Christine Ng

Art Unit

2663

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 04 January 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-8 is/are allowed.
- 6) ☒ Claim(s) 9, 11-16, 20 and 24-26 is/are rejected.
- 7) ☒ Claim(s) 10, 17-19, 21-23, 27 and 28 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 January 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 2.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Specification*

1. The disclosure is objected to because of the following informalities:

a) On page 3 line 8, "--/---,---" should be replaced is "09/755,670".

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 9, 13 and 14 are rejected under 35 U.S.C. 102(b) as being unpatentable by U.S. Patent No. 5,959,995 to Wicki et al.

Referring to claim 9, Wicki et al discloses in Figure 1 a network switch comprising a plurality of input ports (Elements 102) configured to receive data forming one or more packets; a plurality of output ports (Elements 102) configured to convey the packets out of the switch, wherein each output port (Elements 102) comprises a plurality of output queues (Figure 4, Element 412); and a random access memory (Elements 112). The switch also comprises a data transport logic (interconnect, Element 104) coupled between the input ports (Elements 102), the output ports (Elements 102), and the memory (Elements 112). Refer to Column 4, line 62 to Column 5, line 21 and Column 6 lines 48-61.

The method also comprises that:

each input port (Element 102) has a plurality of sequences, wherein the first input port (Element 102) is configured to assign a sequence number to each received packet, wherein the sequence number accompanies the packet through the switch. The source processor node 102 generates a sequence number for each packet for transmission through the interconnect 104. Refer to Column 5, line 46 to Column 6, line 32.

each output port (Element 102) is configured to store a LMSN (next expected sequence number) for each input port register (Element 102). The receiving processing node 102 "stores, for each source processor node 102, the sequence number of the next expected packet 302 from that source processor node 102" (Column 10, lines 53-55).

the first input port (Element 102) is configured to request cut-through routing from a first output port (Element 102) in response to receiving data corresponding to a first packet. When the source processor node 102 transmits packets to a receiving processor node 102, the frame can be sent to the next router or processing node even if the end of the frame has not been received yet, and when the output port is ready. Refer to Column 9, line 59 to Column 10, line 17.

the destination output port (Element 102) is configured to compare (a) the sequence number of the first packet with (b) the stored LMSN (next expected sequence number) for the corresponding input port (Element 102). The receiving processing node 102 compares the next expected sequence number to the extracted sequence number; the extracted sequence number is obtained from the packet header of the arriving packet. Refer to Column 12, lines 42-55.

Referring to claim 13, Wicki et al disclose that each of the plurality of sequences corresponds to a particular output port. Each input processor node 102 transmits a sequence of frames to a particular output processor node 102. Refer to Column 4, line 62 to Column 5, line 21 and Column 6 lines 48-61.

Referring to claim 14, Wicki et al disclose that the packet have variable lengths. "The packet data 308 is of variable length, preferably 0 to 128 bytes of data" (Column 6, lines 1-2).

4. Claims 24-26 are rejected under 35 U.S.C. 102(b) as being unpatentable by U.S. Patent No. 5,307,345 to Lozowick et al.

Referring to claim 24, Lozowick et al disclose in Figure 1 a method for switching packets in a network switch having a plurality of input ports (Elements 30 and 34) and output ports (Elements 32 and 36). As shown in Figure 2, the method comprises receiving data forming a first packet at a first input port (Element 34), wherein the first packet is to be routed to at least a first output port (Element 36). Refer to Column 3, line 58 to Column 4, line 35. The method also comprises switching the packet by cut-through routing (full cut-through) or early forwarding (partial cut-through), wherein cut-through routing (full cut-through) is performed only if (a) no previous packets received at the first input port (Element 34) and destined for the first output port (Element 36) have not been received at the first output port (Element 36), and (b) the first output port (Element 36) has resources to handle the data. Full cut-through is performed "when there are no previous inbound packets queued in the buffer memory 20 and the client side is available to receive transmissions" (Column 5, lines 23-28). The output port 36

immediately begins transmitting data if a "transmit is not currently in operation and there are no pending packets to transmit". Refer to Column 5, lines 46-64.

Referring to claim 25, Lozowick et al disclose in Figure 2 that early-forward routing (partial cut-through) is performed by storing the data to a memory (Element 20), and, in response to detecting that the memory (Element 20) has resources to handle the data, forwarding the packet to the output port (Element 36) from the memory (Element 20). "If a transmit to the client is in progress (or if there are pending packets to transmit) when a receive from the network begins, a new transmit operation will not be immediately started". Data will be stored in buffer memory 20 until there are no pending packets to be transmitted and the output port 36 is ready to start a new transmit. Refer to Column 5, lines 29-36 and Column 6, lines 46-64.

Referring to claim 26, Lozowick et al discloses that the forwarding (to output port 36) begins before the storing (in buffer memory 20) is complete. Partial cut-through allows "the transmission of the current packet to begin before its reception has completed" (Column 5, lines 34-35).

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 11, 12 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,959,995 to Wicki et al in view of U.S. Patent No 5,307,345 to Lozowick et al.

Referring to claims 11 and 12, Wicki et al do not disclose that the output port is configured to ensure that the output queue corresponding to the first packet is empty before granting a cut-through signal.

Lozowick et al disclose in Figure 2 that the output port (Element 36) is configured to ensure that the output queue (buffer memory; Element 20) is empty before granting a cut-through signal (full cut-through). "Full cut-through operation can occur when there are no previous inbound packets queued in the buffer memory 20" (Column 5, lines 25-27). Refer to Column 5, lines 46-64. If the output queue were not empty, the system would be in a partial cut-through operation, since the system would be still transmitting the previous packet while the new packet is being received, thereby adding latency. Refer to Column 6, lines 46-64. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include that the output port is configured to ensure that the output queue corresponding to the first packet is empty before granting a cut-through signal; the motivation being that a full cut-through operation avoids latency by allowing transmission to begin right after reception of the packet, rather than storing the packet before transmission.

Referring to claim 15, Wicki et al do not disclose that the switch is configurable to disable cut-through routing to a particular output port if any data corresponding to an

earlier-received packet to be routed to the particular packet's destination output port is stored in the memory.

Lozowick et al disclose that the switch uses a partial cut-through operation instead of a cut-through routing operation "if a transmit to the client is in progress or if there are pending packet to transmit". In this case, "the previous client transmit operation is completed while data bytes are still being received from the network". Once "there are no pending packet to be transmitted, a new transmit operation will be started". Refer to Column 6, lines 46-64. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include that the switch is configurable to disable cut-through routing to a particular output port if any data corresponding to an earlier received packet to be routed to the particular packet's destination output port is stored in the memory; the motivation being that the transmission of the earlier packet must be completed before the new packet is transmitted, thereby avoiding interleaving of data which may lead to sequencing errors.

7. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,307,345 to Lozowick et al in view of U.S. Patent No. 6,563,837 to Krishna et al.

Lozowick et al discloses in Figure 2 a network switch comprising a plurality of ports, wherein a first one of the ports is an input port (Element 34) configured to receive data forming a packet, wherein a second one of the ports is an output port (Element 36) configured to convey the packet out of the switch; and a random access memory (Element 20). The switch also comprises a means for routing (packet controller,



Element 44) the data between the input port (Element 34), the RAM (Element 20), and the output port (Element 36), wherein the means for routing (packet controller, Element 44) is configured to either route the packet directly to the output (Element 36) by cut-through routing (full cut-through) or route the packet to the RAM (Element 20) for either early forwarding (partial cut-through) or store and forward routing (store and forward). Refer to Column 4, lines 41-44 and Column 5, lines 19-41. The switch comprises that the means (packet controller, Element 44) is configured to route the data from the input port (Element 34) to the output port (Element 36) in response to detecting a cut-through grant signal from the output port (Element 36). Refer to Column 5, lines 46-64. Finally, the switch comprises that the means (packet controller, Element 44) is configured to store the data to the RAM (Element 20) in response to not receiving the cut-through grant signal from the output port (Element 36). Refer to Column 6, line 65 to Column 7, line 7.

Lozowick et al do not disclose that the output port comprises an output FIFO memory and that the input port is configured to store a time value for the output port, wherein the time value corresponds to the last time that the input port added a packet identifier to one of the output port's output queues.

Krishna et al disclose in Figures 1-16 that the output ports (Elements 59-61) comprises FIFO memory. The FIFO memory is a "simple dequeueing operation" for each data link for each output port which performs "as fast as the data link can accept and send the data", allowing the oldest cell in the memory to be serviced first. Refer to Column 17, lines 31-45. Therefore, it would have been obvious to one of ordinary skill

in the art at the time the invention was made to include that the output port comprises an output FIFO memory; the motivation being that a FIFO allows fair dequeueing of data so that the oldest cells are transmitted out first. Krishna et al also disclose in Figure 15 that the input port (Elements 50-52) is configured to store a time value (Elements 153-155) for the output port (Elements 59-61), wherein the time value (Elements 153-155) corresponds to the last time that the input port (Elements 50-52) added a packet identifier (a cell) to one of the output port's output queues (Elements 59-61). "The time stamp indicates the last time this VOQ (i.e. each input, output pair) was able to send a cell" so that "after the cell gets transferred from a VOQ, the last service time for the VOQ gets updated to the current time". Refer to Column 16, lines 17-41. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include that the input port is configured to store a time value for the output port, wherein the time value corresponds to the last time that the input port added a packet identifier to one of the output port's output queues; the motivation being that "input ports that have not recently sent cells will be favored over input ports that have recently sent cells across the switch fabric" (Column 16, lines 39-41); thereby allowing fair dequeueing of data.

8. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,307,345 to Lozowick et al in view of U.S. Patent No. 6,563,837 to Krishna et al, and in further view of U.S. Patent No. 6,094,434 to Kotzur et al.

Referring to claim 20, Lozowick et al and Krishna et al do not disclose that the output port is configured to prevent a second packet arriving at the input port after the

first packet, from being cut-through routed if the first packet has not already been received in the output port.

Kotzur et al disclose that the output port (destination output port) is configured to prevent a second packet arriving at the input port (transmit chain) after the first packet, from being cut-through routed if the first packet has not already been received in the output port (destination output port). During mid-packet interim cut-through (CT) mode, subsequently received packets may be received by other ports for transmission by the same stalled destination output port. In this case, the subsequent packets are placed in a corresponding transmit chain for the destination output port but the packet before the subsequent packets is placed first in the transmit chain in order to ensure proper ordering. Refer to Column 20, lines 5-17. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include that the output port is configured to prevent a second packet arriving at the input port after the first packet, from being cut-through routed if the first packet has not already been received in the output port; the motivation being that this avoids interleaving of packets from different sources destined for the same output port and ensures proper ordering of packets.

***Allowable Subject Matter***

9. Claims 1-8 are allowed.

10. Claims 10, 17-19, 21-23, 27 and 28 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

**Conclusion**

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christine Ng whose telephone number is (703) 305-8395. The examiner can normally be reached on M-F; 8:00 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nguyen Chau can be reached on (703) 308-5340. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

C. Ng CW  
April 8, 2004

  
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